BOOK REVIEW

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The present volume is the third in a series which aims at providing review articles on advances in the several branches of plasma physics and forming, in this way, a channel of communication among plasma physicists in various disciplines.

This volume consists of the following three articles.

1. Kinetic Theory of Plasma Waves in a Magnetic Field—by David E. Baldwin, Ira B. Bernstein and M. P. H. Weenink.
2. Electron Distribution Functions in Weakly Ionized Plasmas—by Ira B. Bernstein
3. Classical Plasma Phenomena from a Quantum Mechanical Viewpoint—by E. G. Harris.

The leading article summarizes the important techniques and results relating to the kinetic theory of wave phenomena in a magnetized plasma. It deals first with small-amplitude waves in an infinite homogeneous plasma and considers a few limiting cases, such as the limit of low temperature and small magnetic field propagation parallel and perpendicular to the magnetic field, etc., the treatment being marked by some interesting mathematical approaches. The effects of boundaries and density gradients are gradually introduced; in this connection the problem of resonances in plasma columns is well discussed and the method of geometric optics is developed to give the synchrotron radiation from a hot magnetoplasma. A helpful feature of the article is the presentation of concise bibliographic notes at the end of each section.

The second article is a comparatively short one, presenting a new approach to an old problem. The electron-neutral collision term is expanded in powers effectively of m/m', the ratio of the electron to neutral mass, and the result is used to give a perturbation solution of the electron Boltzmann equation, which permits derivation of the usual transport coefficients. The treatment is particularly suitable for dealing with boundary conditions. The full Boltzmann equation, encompassing the effect of inelastic processes and charged particle encounters, is briefly discussed.

The third and last article is perhaps the most interesting one in the volume. The dielectric tensor of plasma is derived quantum mechanically, and the linear theory of wave propagation in plasma is discussed. This is followed by the quantization of the electromagnetic field in a dispersive medium. Waves in a plasma are considered as consisting of quasiparticles (plasmas, phonons, photons, etc.) interacting with the particles of the plasma and with each other. Nonlinear effects in plasma, particularly of small magnitude, are throughly discussed in this light. It is worth noting that the quantum mechanical calculations are, in some cases, more straightforward and less difficult than the corresponding classical calculations.

Although the contents of the present volume in the review series are undoubtedly theoretical in nature, the articles would have been more comprehensive and the purpose of the series served better if surveys of the experimental work, wherever pertinent, were included. However, the articles contain authoritative discussions on basic phenomena of plasma physics and the volume can, therefore, be recommended to all concerned with the subject.

J. B.